Assimilation radar reflectivity to improve the simulation of a squall line case

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Based on assimilation of radar radial wind, radar retrieval wind and GPS water vapor data using Ensemble Kalman Filtering (EnKF) method, the initial water vapor field of a squall line occurred on July 30, 2014 in of East Central Anhui was adjusted according to radar reflectivity data. Compared with the simulation results of EnKF, this method has improved the intensity, location, duration, precipitation and surface wind of the squall line. Simulation performance of ground convergence zone near front the squall line is improved after adjusting humidity field, leading to better simulation results of the intensity and location of the squall line. In addition, the squall line maintained for a short time without humidity adjustment. This can be explained by that mid-level dry air entrainment is weak at the rear of the squall line, and the cold pool is quickly propagate away from the squall line, which is unfavorable for maintenance of squall line. In contrast, when the humidity field is adjusted, dry air entrainment at the rear of the squall line is strong, and the resultant downdraft generate the cold pool, which is located in the rear of the squall line, favorable for the squall line maintenance. The possible reason of dry air entrainment strengthening is: atmospheric instability is increased as the moisturizing of middle-low level (600 - 900 hPa) after the humidity field adjustment, and result in the enhancement of the convection and the meso-low system. The westerly in the south of meso-low intensifies, and strengths the rear dry cold air entrainment. This experiment reveals that the adjustment of the humidity leads to the adjustment of the dynamic field, and play an important role in the development and organization of the convection system.

Keywords: squall line, data assimilation, Ensemble Kalman Filtering, radar reflectivity data

